

1 CLAIMS:

2 1. A method of forming a polished material, comprising:

3 providing a substrate;

4 forming a trench within the substrate and an etchstop proximate
5 the trench, the substrate having a surface and the etchstop having an
6 uppermost surface above the substrate surface;

7 forming a material within the trench and extending to above the
8 etchstop uppermost surface, the material comprising a lower layer and
9 an upper layer, the lower layer polishing at slower rate than the upper
10 layer under common polishing conditions, the lower layer joining the
11 upper layer at an interface; and

12 polishing the material down to at or below about an elevational
13 level of the etchstop uppermost surface utilizing the common polishing
14 conditions.

15
16 2. The method of claim 1 wherein the interface extends to
17 below an elevational level of the etchstop uppermost surface.

18
19 3. The method of claim 1 wherein a lowermost portion of the
20 interface is above an elevational level of the etchstop uppermost surface.

1 4. The method of claim 1 wherein the interface extends to a
2 location below an elevational level of the etchstop uppermost surface and
3 at least as high as about an elevational level of the substrate surface.

4
5 5. The method of claim 1 wherein the upper and lower layers
6 comprise silicon dioxide.

7
8 6. The method of claim 1 wherein the trench comprises a
9 substantially vertical sidewall.

10
11 7. The method of claim 1 wherein the substrate comprises
12 monocrystalline silicon, and wherein the etchstop comprises silicon nitride.

13
14 8. The method of claim 1 wherein the material formed within
15 the trench comprises silicon dioxide, and wherein the lower layer of the
16 silicon dioxide comprises a higher density than the upper layer of the
17 silicon dioxide.

1 9. A method of forming a polished material, comprising:
2 providing a substrate and providing an elevational step relative to
3 the substrate, the elevational step having an uppermost surface;
4 forming a material beside the elevational step and extending to
5 above the elevational step uppermost surface, the material comprising a
6 lower layer and an upper layer, the lower layer polishing at slower rate
7 than the upper layer under common polishing conditions, the lower layer
8 joining the upper layer at an interface; and
9 polishing the material down to about the elevational level of the
10 elevational step uppermost surface utilizing the common polishing
11 conditions.

12
13 10. The method of claim 9 wherein the interface extends to at
14 or below an elevational level of the elevational step uppermost surface.

15
16 11. The method of claim 9 wherein the upper and lower layers
17 comprise silicon dioxide.

18
19 12. The method of claim 9 wherein the step comprises a
20 substantially vertical sidewall.

1 13. The method of claim 9 wherein the material is formed to
2 extend over the elevational step uppermost surface, and wherein the
3 polishing removes the material from over the elevational step uppermost
4 surface.

5
6 14. The method of claim 9 wherein the substrate comprises
7 monocrystalline silicon, and wherein the elevational step comprises both
8 monocrystalline silicon and silicon nitride.

9
10 15. The method of claim 9 wherein the substrate comprises
11 monocrystalline silicon, wherein the elevational step comprises both
12 monocrystalline silicon and silicon nitride, wherein the silicon nitride is
13 a layer over the monocrystalline silicon and has an upper surface
14 coextensive with the elevational step uppermost surface, the
15 monocrystalline silicon having an upper surface, and the interface having
16 a lowestmost portion at an elevational level between the elevational level
17 of the elevational step uppermost surface and an elevational level of the
18 monocrystalline silicon upper surface.

19
20 16. The method of claim 9 wherein the interface extends to
21 below the elevational level of the elevational step uppermost surface.
22
23

1 17. The method of claim 9 wherein the upper and lower layers
2 comprise silicon dioxide and are formed by plasma deposition; the lower
3 layer being formed while maintaining a temperature of the substrate at
4 from about 500°C to about 700°C, and the upper layer being formed
5 while maintaining a temperature of the substrate at from about 300°C
6 to about 400°C.

7
8 18. A method of forming a polished material, comprising:
9 providing a substrate and providing an elevational step relative to
10 the substrate, the elevational step having an uppermost surface;
11 forming a material beside the elevational step and extending to
12 above the elevational step uppermost surface, the material comprising a
13 lower layer and an upper layer, the lower layer polishing at slower rate
14 than the upper layer under common polishing conditions, the lower layer
15 joining the upper layer at an interface; and
16 polishing the material at least down to the interface utilizing the
17 common polishing conditions.

1 19. A method of forming a polished material, comprising:
2 providing a substrate and providing an elevational step relative to
3 the substrate, the elevational step having an uppermost surface;
4 forming a material beside the elevational step and extending to
5 above the elevational step uppermost surface, the material comprising a
6 lower layer and an upper layer, the lower layer being more dense than
7 the upper layer, the lower layer joining the upper layer at an interface
8 that extends to at or below an elevational level of the elevational step
9 uppermost surface; and
10 polishing the material at least down to about the elevational level
11 of the elevational step uppermost surface.

12
13 20. The method of claim 19 wherein the polishing comprises
14 chemical-mechanical polishing.

15
16 21. The method of claim 19 wherein the material is formed to
17 extend over the elevational step uppermost surface, and wherein the
18 polishing removes the material from over the elevational step uppermost
19 surface.

20
21 22. The method of claim 19 wherein the upper and lower layers
22 comprise silicon dioxide.
23

1 23. The method of claim 19 wherein the substrate comprises
2 monocrystalline silicon, and wherein the elevational step comprises both
3 monocrystalline silicon and silicon nitride.
4

5 24. The method of claim 19 wherein the interface extends to
6 below the elevational level of the elevational step uppermost surface.
7

8 25. The method of claim 19 wherein the upper and lower layers
9 comprise silicon dioxide and are formed by plasma deposition; the lower
10 layer being formed while maintaining a temperature of the substrate at
11 from about 500°C to about 700°C, and the upper layer being formed
12 while maintaining a temperature of the substrate at from about 300°C
13 to about 400°C.
14
15
16
17
18
19
20
21
22
23

1 26. A method of polishing a material, comprising:

2 providing a substrate having an opening extending therein, the
3 substrate having a surface proximate the opening;

4 forming a material within the opening and extending to above the
5 substrate surface, the material comprising a lower layer and an upper
6 layer, one of the lower and upper layers polishing at a slower rate than
7 the other of the lower and upper layers under common polishing
8 conditions, the lower layer joining the upper layer at an interface that
9 extends from above an elevational level of the substrate surface to below
10 said elevational level; and

11 polishing the material at least at least down to about the
12 elevational level of the substrate surface utilizing the common polishing
13 conditions.

14
15 27. The method of claim 26 wherein the lower layer polishes at
16 the slower rate.

1 28. A method of forming a trench isolation region, comprising:
2 providing a substrate having a trench opening extending therein,
3 the substrate having a surface proximate the opening;

4 forming an insulative material within the opening and extending to
5 above the substrate surface, the material comprising a lower layer and
6 an upper layer, the lower layer polishing at a slower rate than the upper
7 layer under common polishing conditions, the lower layer joining the
8 upper layer at an interface that extends to at or below an elevational
9 level of the substrate surface; and

10 polishing the material at least down to about the elevational level
11 of the substrate surface utilizing the common polishing conditions.

12
13 29. The method of claim 28 wherein the upper and lower layers
14 consist essentially of the same chemical composition and differ only in
15 density.

16
17 30. The method of claim 28 wherein the upper and lower layers
18 comprise silicon dioxide.

19
20 31. The method of claim 28 wherein the material is formed to
21 extend over the substrate surface, and wherein the polishing removes the
22 material from over the substrate surface.

1 32. The method of claim 28 wherein the interface extends to
2 below the elevational level of the substrate surface.

3
4 33. The method of claim 28 wherein the substrate comprises a
5 silicon nitride layer over monocrystalline silicon, wherein the opening
6 extends through the silicon nitride layer and into the monocrystalline
7 silicon, and wherein the substrate surface is a surface of the silicon
8 nitride layer.

9
10 34. The method of claim 28 wherein the upper and lower layers
11 comprise silicon dioxide and are formed by plasma deposition; the lower
12 layer being formed while maintaining a temperature of the substrate at
13 from about 500°C to about 700°C, and the upper layer being formed
14 while maintaining a temperature of the substrate at from about 300°C
15 to about 400°C.

1 35. A method of forming an isolation region, comprising:
2 providing a substrate having an opening extending therein, the
3 substrate having a surface proximate the opening;
4 forming a material within the opening and extending to above the
5 substrate surface, the material comprising a lower layer and an upper
6 layer, one of the upper and lower layers being more dense than the
7 other of the upper and lower layers, the lower layer joining the upper
8 layer at an interface that extends from over an elevational level of the
9 substrate surface to at or below said elevational level; and
10 polishing the material at least down to about the elevational level
11 of the substrate surface.

12
13 36. The method of claim 35 wherein the lower layer is more
14 dense than the upper layer.
15
16
17
18
19
20
21
22
23

1 37. A method of forming an isolation region, comprising:
2 providing a substrate having an opening extending therein, the
3 substrate having a surface proximate the opening;
4 forming a material within the opening and extending to above the
5 substrate surface, the material comprising a lower layer and an upper
6 layer, the lower layer being more dense than the upper layer, the lower
7 layer joining the upper layer at an interface that extends to at or below
8 an elevational level of the substrate surface; and
9 polishing the material at least down to about the elevational level
10 of the substrate surface.

11
12 38. The method of claim 37 wherein the upper and lower layers
13 consist essentially of the same chemical composition and differ only in
14 density.

15
16 39. The method of claim 37 wherein the upper and lower layers
17 comprise silicon dioxide.

18
19 40. The method of claim 37 wherein the material is formed to
20 extend over the substrate surface, and wherein the polishing removes the
21 material from over the substrate surface.

1 41. The method of claim 37 wherein the interface extends to
2 below the elevational level of the substrate surface.

3
4 42. The method of claim 37 wherein the substrate comprises a
5 silicon nitride layer over monocrystalline silicon, wherein the opening
6 extends through the silicon nitride layer and into the monocrystalline
7 silicon, and wherein the substrate surface is a surface of the silicon
8 nitride layer.

9
10 43. The method of claim 37 wherein the upper and lower layers
11 comprise silicon dioxide and are formed by plasma deposition; the lower
12 layer being formed while maintaining a temperature of the substrate at
13 from about 500°C to about 700°C, and the upper layer being formed
14 while maintaining a temperature of the substrate at from about 300°C
15 to about 400°C.

1 44. A method of forming an isolation region, comprising:
2 providing a bulk monocrystalline silicon substrate;
3 forming a patterned layer over the substrate, the patterned layer
4 defining an opening over the substrate and comprising an upper surface
5 proximate the opening;
6 extending the opening into the substrate;
7 forming a material within the opening and extending to above the
8 patterned layer upper surface, the material comprising a lower layer and
9 an upper layer, the lower layer being more dense than the upper layer,
10 the lower layer joining the upper layer at an interface that extends to
11 at or below an elevational level of the upper surface; and
12 polishing the material at least down to about the elevational level
13 of the upper surface.

14
15 45. The method of claim 44 wherein the patterned layer
16 comprises silicon nitride, the silicon nitride of the patterned layer being
17 separated from the monocrystalline silicon by a layer of silicon dioxide.

18
19 46. The method of claim 44 wherein the material is formed to
20 extend over the patterned layer upper surface, and wherein the polishing
21 removes the material from over the patterned layer upper surface.
22
23

1 47. The method of claim 44 wherein the upper and lower layers
2 comprise silicon dioxide.

3
4 48. The method of claim 44 wherein the interface extends to
5 below the elevational level of the patterned layer upper surface.

6
7 49. The method of claim 44 wherein the upper and lower layers
8 comprise silicon dioxide and are formed by plasma deposition; the lower
9 layer being formed while maintaining a temperature of the substrate at
10 from about 500°C to about 700°C, and the upper layer being formed
11 while maintaining a temperature of the substrate at from about 300°C
12 to about 400°C.